those whose means and leisure permitted, was that of pupilage. Now it is quite recognised that an alternative method of commencing training is afforded by well equipped Technical Colleges. In conclusion, Sir William White referred to the steps which have been taken in the organisation of educational work in Bristol, and to prevent over-lapping of the various institutions and authorities concerned with education. Prof. Wertheimer, the headmaster, reports that, acting on the suggestions of the Technical Instruction Committtee of the Bristol Town Council, the Governors of the Technical College have completed an agreement with the Bristol School Board, in virtue of which the evening class work of the Board and of this College, in science and technology, are so arranged as to avoid overlapping. In virtue of an agreement with the Bristol School of Art, the Art School of the College will be closed at the end of this session, and art students will be advised to attend the other school; the School of Art on its side will close its science classes and advise its students of science to attend the College. The relation of the Technical College to the University College does not appear to be mentioned in the report.

SCIENTIFIC SERIALS.

American Journal of Science, February.—Sedimentary rocks of Southern Patagonia, by J. B. Hatcher. Two years of further study have greatly augmented the results obtained since the first report. Chief among the additional observations and resultant modifications of the author's former views are :—(1) The discovery near Sandy Point, in the Strait of Magellan, of an entirely new series of Tertiary deposits several hundred feet thick, and underlying the Patagonian Beds. These new Tertiary deposits have already been noticed by Dr. A. E. Ortmann, and have been named by him the Magellanian Beds. (2) The discovery near Lake Pueyrredon of several distinct fossil-bearing horizons in the Cretaceous.—Explorations of the *Albatross* in the Pacific (II.), by Alexander Agassiz. The choice of Dolphin Bank, Tahiti, as a standard to determine the growth of coral turns out to have been unfortunate, as it is in the midst of an area comparatively free from corals. Only a few growing corals were found by the author, the top of the bank being entirely covered by Nullipores. After coaling at Tahiti, the *Albatross* left for a cruise in the Paumotus. The western islands are probably all on a great plateau connected perhaps by the 800-fathom line. The soundings, like those off the Fijis, show that atolls do not necessarily rise from great depths, and that in this characteristic atoll district atolls are found, it is true, with steep slopes, but rising from moderate depths.—Action of ammonium chloride upon analcite and leucite, by F. W. Clarke and G. Steiger. When analcite is heated with four times its weight of ammonium chloride, about one-half of the soda in the analcite is converted into chloride, while variable ammonia is retained. Other zeolites, like leucite, natrolite, laumontite, stilbite, chabazite, apophyllite, show a similar reaction, varying, however, to an extent which probably depends upon their molecular structure. A new means of studying the latter is thus provided.—Devonian strata in Colorado, by A. C. Spencer. Devonian and associated strata were deposited originally over an extensive area in the southern Rocky Mountain region, the boundaries of which are as yet entirely unknown.—Estimation of thallium as the acid and neutral sulphate, by P. E. Browning. The salt obtained by heating thallous chloride with sulphuric acid until the excess of the latter is expelled, and then raising the heat to redness, has the constitution of a neutral sulphate. The author tested whether this neutral sulphate, or the acid sulphate described by thallium, can be used for the estimation of thallium, and finds that it can be done, provided the conditions of temperature are carefully attended to.—Motion of a submerged index-thread of mercury in the lapse of time, by C. Barus. The author endeavoured to frame a theory to account for the observed gradual sinking of an index-thread of mercury in a vertical tube containing water. He proceeded on the supposition that water penetrates past the index-thread in a very thin sheet, but found that the thickness of the sheet would have to be far below that of a molecule of water. He eventually found that the sinking was due to the volume viscosity of glass. A four years' experiment showed that the sinking proceeds at a regularly retarded rate through infinite time.

Annalen der Physik (formerly *Wiedemann's Annalen*), No. 1.—A study on soap-bubbles, by O. Dörge. The author performs on a soap-bubble a cyclical electric process analogous to a Carnot cycle, the expansion and contraction being either at constant charge or at constant potential. He arrives at a law which states that no process is possible in which electric energy is transferred without loss or gain from one potential to another. This law corresponds to the second law of thermodynamics.—Diffuse reflection of light, by H. Wright. If the angle of incidence is constant, the intensity of reflected light varies as the cosine of the angle of reflection in the case of perfectly dull surfaces. The converse does not hold good, so that Lambert's law is only partially correct.—Electric conductivity of dilute amalgams, by A. Larsen. Experiments upon amalgams of lead, zinc, cadmium, tin and bismuth show that the metal contained in dilute liquid amalgams is dissociated, and that the degree of dissociation increases with the dilution and the temperature.—Stationary temperature of an electrically heated conductor, by F. Kohlrausch. The author supposes a conductor whose surface is protected from loss of heat, except two terminals, each of which is kept at a constant temperature and a constant potential. When the stationary state has been attained, all points at the same potential will also have the same temperature. The greatest quantity of heat will be developed in those metals in which the ratio of the thermal to the electrical conductivity is smallest.—Spark potential in gases, by A. Orgler. The author proposes a new definition of the "specific electric strength" of a gas, which gives a real constant for any given gas. If δ is the width of the gap, and A and B the spark potentials in the gas and in air respectively, the specific electric strength is the ratio $\frac{dA}{d\delta} : \frac{dB}{d\delta}$. It is units for air, 0·888 for carbonic acid, and 0·563 for hydrogen, whatever the width of the gap.—Molecular susceptibility of paramagnetic salts of the iron group, by O. Liebknecht and A. P. Wills. Jäger and Meyer's series of atomic susceptibilities of Mn, Fe″, Co, and Ni, in the ratio of 6 : 5 : 4 : 2, is not confirmed, the numbers obtained being 6·98 : 5·86 : 4·70 : 2. Wiedemann's series a, $a+b$, $a+\frac{3}{2}b$, $a+2b$ agrees rather better with facts, but a still closer approximation is obtained by putting $b=1{\cdot}25a$ instead of $1{\cdot}15a$. There is a sudden rise from chromium to manganese and ferric iron, and a gradual fall from the latter to cobalt, nickel and copper.—Molecular susceptibilities of salts of the rare earths, by H. du Bois and O. Liebknecht. There is a gradual rise from cerium to praseodymium and neodymium; a decided rise in samarium, gadolinium and erbium, and a sudden fall to ytterbium.—Magnetic viscosity, by Lizzie R. Laird. To preserve the initial or instantaneous magnetisation of a disc for measurement, it is kept in rotation, and the rise of intensity of magnetisation on stoppage is recorded by a photographic device.

THE number of the *Journal of the Royal Microscopical Society* for February 1900 contains a further instalment of Mr. F. W. Millett's Report on the recent Foraminifera of the Malay Archipelago, collected by Mr. A. Durrand; and a paper by Dr. H. C. Sorby, F.R.S., on the Preparation of Marine Worms as Microscopical Objects, the fluid used for removing the salt being a strong solution of glycerin. The character and arrangement of the blood-vessels are especially well brought out by this mode of treatment. Among the paragraphs relating to Microscopy may be especially mentioned an abstract of van Heurck's paper, from the *Annales de la Société Belge de Microscopie*, on Modern Apochromatic Objectives.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, January 18.—"An Experimental Investigation of the Thermodynamical Properties of Superheated Steam." By John H. Grindley, B.Sc., Wh.Sc. Communicated by Prof. Osborne Reynolds, F.R.S.

In Regnault's experiments on the relations between the pressure, temperature, and latent heats of saturated steam, the steam to be experimented upon was obtained by withdrawing it upwards from a boiler, allowing any entrained moisture to be separated by gravity. Saturated steam obtained in any other manner would not necessarily have the same total heat of evaporation as that obtained by Regnault.

Whether the steam could always be brought into the same condition, as regards its freedom from moisture, by such a process of drainage was open to question, and it remained to be deter-

mined by further researches whether this condition was unique at any particular pressure and temperature in the saturated steam.

When saturated steam is wiredrawn by free expansion through a small orifice, if the pressure in the wiredrawn steam be sufficiently reduced, the steam will become superheated, and, if the flow through the orifice is truly adiabatic, the total energy per lb. of steam is the same on both sides of the orifice. Now, if the energies of motion be made sufficiently small, this energy will exist as heat, and, assuming the steam before passing the orifice to be in the same condition as that experimented on by Regnault, its total heat energy above that of water at 32° F. is known, and hence the total heat of gasification of the superheated wiredrawn steam from water at 32° F. is known. If, therefore, we observe the pressures and temperatures in superheated steam wiredrawn from definite initial saturated conditions, simple calculations will suffice to give various values of the specific heat at constant pressure in superheated steam.

In the experiments, the author obtained adiabatic flow by using orifices drilled in pieces of plate glass. The temperature and pressure of saturated steam in a steam chest, in which a constant supply of steam is kept, are taken, the steam is then drawn upwards to the orifice, and, after wiredrawing, its pressure and temperature are again taken, using for the determination of the latter a thermoelectric junction immersed in the steam.

The results of the experiments show that saturated steam at any particular pressure, obtained by relieving it of suspended moisture by gravitation, has only one condition as to its dryness, and the total heat of evaporation of steam so obtained is that given by Regnault's experimental results.

It is further shown that steam obtained in this manner has not the maximum density at that particular pressure and temperature of saturation, there being still an effect as if a small quantity of moisture remained in the steam, which would require removal by further application of heat at the same temperature before the steam would become superheated, thus showing that the latent heat of such steam as given by Regnault's results, has not its maximum value.

It was also found that by an application of Prof. Reynold's method of determining the perfectly gaseous condition of steam, under ordinary pressures and temperatures, no indications of that condition of steam known as a perfect gas were even approximately obtained, and that Rankine's formula

$$H = H_0 + c(T - 32)$$

for the total heat of gasification H of superheated steam at a temperature T (H_0 being the latent heat of formation of steam at 32° F.), which was formed on the assumption that such a perfect gas condition did exist in steam, could not be applied to superheated steam.

The mean specific heat under constant pressure was obtained for various pressures and between various temperatures, showing a wide range of variation in its value with temperature. Thus, at atmospheric pressure the mean K_ρ between 230° F. and 246°·5 was 0·4317, and between temperatures of 295° and 311°·5, K_ρ was 0·6482.

The specific heat K_ρ was found to be independent of the pressure, but to vary very nearly as the fourth power of the absolute temperature.

If $c\left(=\frac{\partial\theta}{\partial p}\right)$ denote the cooling effect produced by free expansion, the following formula, which is thermodynamically correct, viz. :

$$\frac{\partial}{\partial p}\left(K_\rho\right) = -\frac{\partial}{\partial T}\left(cK_\rho\right) \quad \ldots\ldots (1)$$

enables a check to be made on the experimental results, for if K_ρ is independent of the pressure, the product cK_ρ must be independent of the temperature. In the experiments, the product cK_ρ was found to be independent of both pressure and temperature.

By integrating Thomson's formula

$$\frac{dT}{T} = \frac{dv}{v + cK_\rho} \quad \ldots\ldots (2)$$

for the cooling effect c, and using the experimental value of the product cK_ρ obtained, values of the specific volumes (v) of superheated steam at various pressures and temperatures were calculated, the lower limit of integration being taken from the known data in the saturated condition of steam.

It follows from equation (1) that, for any gas in which K_ρ is independent of the pressure, and this is so for many gases, formula (2) must be capable of direct integration in the form

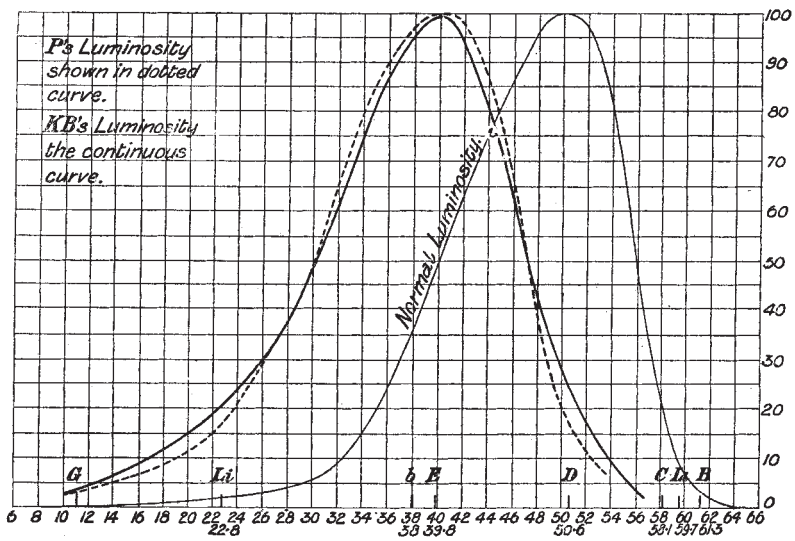
$$\frac{v + cK_\rho}{T} = f(p),$$

where $f(p)$ denotes any function of the pressure.

February 1.—"A Case of Monochromatic Vision." By Sir W. de W. Abney, K.C.B., F.R.S.

The patient, K. B., was aged twenty-five, and the notes of his case are as follows:—Vision always defective; has always been colour blind. Has quick horizontal nystagmus; probably an absolute central scotoma. He is always "day blind." His vision for right and left eyes is 6/60. He is not night blind. His fields are nearly, but not quite, full for white. He shows no definite changes in his eyes. As to his luminosity curve, he matched all colours with white, and with the same facility as if they were white.

In the accompanying diagram the curve shows the luminosity of the spectrum to the patient K. B. and also of a previous case, P., together with the curve of luminosity for the normal eye.



As regards the first two, it will be seen that the maximum of each curve is about scale number 40, or close to E. On the right-hand side of the maximum the curves do not absolutely agree. K. B.'s observations were first made in the red and green, and his readings at first were not very close, and a mean had to be taken. As the colours he had measured went towards the blue his measures were much more accordant, as he had become accustomed to the methods employed. The slight divergence on the left-hand side of the curve from that of P is probably due to his colouring matter in the yellow spot. Attention must be again called to the fact that these curves are practically identical with those obtained by the normal eye when it measures a spectrum of very feeble luminosity, and also agrees with the results obtained by measuring the diminution of each ray when it first becomes invisible, and making a curve of the reciprocals of the numbers, taking the highest point of it as 100.

Physical Society, February 23.—Prof. S. P. Thompson, F.R.S., Foreign Secretary, in the chair.—Prof. R. W. Wood, of the University of Wisconsin, U.S.A., exhibited and described: (1) Photographs of sound waves and the kinematographical demonstration of the evolutions of reflected wave-fronts. The

sounds were produced by electric sparks, and photographed by means of the light emitted by carefully-timed subsequent sparks, according to the methods described in the *Phil. Mag.* for last year. The photographs included: (*a*) The reflection of a spherical wave, as a spherical wave from a plane surface; (*b*) the reflection, by an ellipse, of circular waves from one focus, and the concentration of the waves, as circular waves, at the other focus; (*c*) the plane wave-front formed by the reflection of a spherical wave at a parabolic surface; (*d*) the wave-front formed by a spherical wave incident on a spherical surface; (*e*) the wave-front formed by a plane wave incident on a spherical surface. In cases (*d*) and (*e*) the wave-fronts are complicated, and contain cusps. Prof. Wood pointed out that the paths of the cusps on the wave-fronts traced out the caustic curves. In the following cases the wave-fronts were drawn for one hundred successive positions, and the evolution of the reflected wave was made clear by means of a kinematograph: (*a*) Plane wave on a hemispherical mirror; (*b*) spherical wave on a hemispherical mirror; and (*c*) circular wave inside a complete circular mirror. (2) A new seudoscope. In this instrument the real and inverted images formed by two convex lenses are viewed stereoscopically. The inversion of the object viewed causes the relief to be reversed. (3) Diffraction colour-photographs. Prof. Wood showed some coloured photographs taken by his diffraction process. The principle of the method is based upon the tri-colour theory. Different colours are produced by gratings so ruled and arranged as to throw upon the eye the particular constituents of the required colours. The arrangement of gratings necessary to produce a coloured picture is obtained by photographing properly spaced gratings through red, green and blue chromograms of the object. The superposition of one grating upon another which occurs in this process gives rise to an in-and-out-of-step arrangement, which produces secondary spectra. These, however, seldom affect the picture to any serious extent. (4) Artificial parhelia. When printing fine gratings upon gelatine, if the film is too thick, no print is formed, but the gelatine warps. If such a film is placed in a converging beam, the central image is accompanied by four marked concentrations of light situated at the extremities of two diameters at right angles. An examination of one of these plates with a microscope shows that there is a ridge for every third line of the grating, and that the plate is crossed at right angles to these lines by irregularly spaced cross ridges. Prof. Wood also exhibited some photographs taken by zone plates, a silvered copy of a Rowland grating, a photograph of a dynamite explosion, the motion of a ball in its flight, and the anomalous dispersion produced by a cyanine prism.—Mr. Boys gave some details concerning the photograph of the explosion shown.—Prof. Everett expressed his interest in the demonstrations.—Prof. Herschel asked if the photographs of sound waves after reflection had been verified by comparison with waves on mercury.—Mr. Watson pointed out that this could not be done, as it is impossible to get a solitary wave on the surface of mercury. Owing to the dependence of velocity on wave-length, any such solitary wave draws out into a train of waves.—The chairman proposed a vote of thanks to Prof. Wood, and announced that, by invitation of Prof. Callendar, a special meeting will be held at University College on March 2.—The meeting then adjourned.

Chemical Society, February 8.—Sir Henry Roscoe, Vice-President, in the chair.—Prof. T. E. Thorpe, President, delivered the Victor Meyer Memorial Lecture.—February 15, Prof. Thorpe, President, in the chair.—The following papers were read.—Ammonium amidosulphite, by E. Divers and Masataka Ogawa. Dry ammonia and sulphur dioxide do not combine at a low temperature, but on passing sulphur dioxide into a dry ethereal ammonia solution, a colourless, deliquescent unstable salt, ammonium amidosulphite, $NH_4.SO_2.NH_2$, is deposited; it is decomposed by water and dissolves in alcohol with formation of ethyl ammonium sulphite.—On the products obtained by heating ammonium sulphites, thiosulphate and trithionate, by E. Divers and Masataka Ogawa. Anhydrous ammonium sulphite and pyrosulphite sublime unchanged on heating in dry nitrogen.—The colour of alkali nitrites, by E. Divers. The author confirms his previous statement that the alkali nitrites have a slight yellow colour which is specially marked in solution.—Solubility of mixed potassium nitrite and nitrate, by E. Divers.—The combination of sulphur dioxide with oxygen, by E. J. Russell and N. Smith. When a mixture of sulphur dioxide and oxygen acts on certain oxides, in addition to the absorption of sulphur dioxide, sulphur trioxide is formed, owing apparently to the "surface action" of the oxide; no sulphur trioxide is formed unless a simultaneous absorption of sulphur dioxide occurs.—Notes on the estimation of gaseous compounds of sulphur, by E. J. Russell. Volumetric methods of analysis are given which work satisfactorily in the estimation of sulphur dioxide, hydrogen sulphide, carbonyl sulphide and carbon disulphide in gaseous mixtures.—The influence of the "nascent state" on the combination of dry carbon monoxide and oxygen, by E. J. Russell. The nascent condition has no great effect in promoting combination between carbon monoxide and oxygen, the unburnt residue of carbon monoxide being similar in amount to that found in Dixon's experiments; the sources of nascent carbon monoxide used were carbonyl sulphide and nickel carbonyl, whilst nascent oxygen was supplied by the monoxide and peroxide of chlorine.—Asymmetric optically active tin compounds. Dextromethylethyl-n-propyl tin iodide. Preliminary note, by W. J. Pope and S. J. Peachey. The previously unknown mixed alkyl tin compounds of the type $SnX^{I}X^{II}X^{III}X^{IV}$ can be readily prepared from trimethyl tin iodide by the following series of reactions:

(1) $2SnMe_3I + ZnEt_2 = 2SnMe_3Et + ZnI_2$.
(2) $SnMe_3Et + I_2 = SnMe_2EtI + MeI$.
(3) $2SnMe_2EtI + ZnPr_2 = 2SnMe_2EtPr + ZnI_2$.
(4) $SnMe_2EtPr + I_2 = SnMeEtPrI + MeI$.

On treating methylethylpropyl tin iodide with silver dextrocamphorsulphonate, it yields dextromethylethylpropyl tin dextrocamphorsulphonate, $SnMeEtPr(C_{10}H_{15}OSO_3)$, from the aqueous solution of which dextromethylethyl-n-propyl tin iodide may be precipitated by potassium iodide.—Note on the refraction and magnetic rotation of hexamethylene, by S. Young and E. C. Fortey.—Apiin and apigenin. Part II. Note on vitexin, by A. G. Perkin.—The yellow colouring principles of various tannin matters, VII., by A. G. Perkin.—Note on the bromo-derivatives of camphopyric acid, by J. A. Gardner. Camphopyric acid yields two derivatives, α- and β-bromocamphopyric acid, with bromine; the former gives an α-hydroxycamphopyric acid, $C_9H_{13}(OH)O_4$, on hydrolysis with potash.

Mathematical Society, February 8.—Prof. Elliott, V.P., F.R.S., and subsequently Lieut.-Colonel Cunningham, V.P., in the chair.—Prof. Elliott announced that the Council had passed the following resolution, and registered the same at Somerset House, viz. that the objects of the Society requiring that it shall consist of more than 250 members, it is resolved that the number of its members may be increased by further elections to 350.—Prof. Love, F.R.S., communicated a paper, by Mr. J. H. Mitchell, on some elementary distributions of stress in three dimensions, and Major MacMahon, F.R.S., gave a sketch of further results arrived at by him in combinatorial analysis, the foundation of a new theory.—The following papers were taken as read, viz.: A formula in the theory of the theta functions, by Prof. A. C. Dixon; The canonical reduction of a pair of bilinear forms, and Reduction of a generalised linear substitution to a canonical form, with a dynamical application, by Mr. Bromwich.

Anthropological Institute, February 13.—Mr. C. H. Read, President, in the chair.—Mr. W. L. H. Duckworth presented a note on the Congress of German and Viennese anthropological societies held at Lindau in September 1899, and on the anthropological faculty lately established in the University of Munich.—Dr. R. Koettlity gave a detailed description of the ethnography and civilisation of the Somali, Galla, Abyssinian, and Shangalla tribes, which he had the opportunity of studyiug during a recent journey from the Gulf of Aden to Khartoum. The paper was illustrated by many lantern slides from sketches and photographs, and by a large number of specimens collected in the course of the expedition.—In the discussion which followed, Mr. E. G. Ravenstein laid great stress upon the importance of a careful and detailed study of the natives of the region in question, and especially of the southern Galla tribes, who remain practically uninfluenced either by the Mohammedanism of the coast or by the debased Christianity of the Abyssinians in the interior.

Royal Meteorological Society, February 21.—Mr. E. Mawley read his report on the phenological observations for last year, in which he showed that the weather for the year ending November 1899 was chiefly remarkable for its high

temperatures, scanty rainfall, and splendid record of sunshine. The winter and summer were singularly warm seasons, while the autumn was also warm, but during the three spring months rather low temperatures prevailed. In the early part of the flowering season, wild plants came into blossom in advance of their mean dates, but after March they were mostly late in coming into bloom. Taking the country as a whole, the best farm crop of the year was wheat; the yield of barley proved also good, while oats were slightly under average. The crops mostly affected by the dry weather were those of hay and turnips, the latter being in most districts exceptionally poor. The only part of the British Isles where the summer drought was not severely felt was in Ireland, throughout a great part of which there was abundant keep in the pastures during the whole summer. This year was a very bad one for fruit. The yield of apples, pears, plums and strawberries varied greatly in different localities, but was in most of them much under average.—Dr. R. H. Scott, F.R.S., read a paper giving the results of the percolation experiments which have been carried on at Rothamsted by Sir J. B. Lawes and Sir J. H. Gilbert, from September 1870 to August 1899. Three gauges were used, with 20 inches, 40 inches and 60 inches depth of soil respectively; the area of each gauge being one-thousandth of an acre. The amount of water collected at the depth of 40 inches is always in excess of that collected at 20 inches, and also of that collected at 60 inches. In the winter months more than half the amount of rain penetrates into the soil and is available for springs, while in summer this amount only reaches a quarter that of the rain.

MANCHESTER.

Literary and Philosophical Society, February 20.—Prof. Horace Lamb, F.R.S., President, in the chair.—Some criticisms on the modern theory of solutions, by Edgar F. Morris. By applying the ordinary assumptions of the kinetic theory of solutions to the case of a semipermeable cell depressed below the surface of the solvent, the result is deduced that the percentage composition of any solution is a linear function of its density. The form of the reaction equation for the catalysis of esters shows that the action cannot be attributed to independently moving ions. Other facts disproving this theory are the occurrence of electrolytic solutions with normal molecular weights, and of cases where the molecules would have to be regarded as split into most curious fragments to provide a sufficient number of ions—in the case of certain metals in mercury solution into more ions than atoms. Prof. Fitzgerald has previously shown the physical basis of this theory to be unsound, and, as the chemical applications give untrue results, it was held that the theory should be abandoned.

EDINBURGH.

Mathematical Society, February 9.—Mr. R. F. Muirhead, President, in the chair.—Remark on Dr. Peddie's proof of a theorem in potential, by Mr. R. F. Muirhead.—A general mechanical description of the conic sections, by Mr. Alex. Morrison.—On Bessel functions and spherical harmonics, by Mr. John Dougall.

DUBLIN.

Royal Dublin Society, January 17.—Sir Howard Grubb, F.R.S., in the chair.—Mr. W. E. Thrift read a paper on the possible rapidity of movements in cells produced by diffusion, the paper being communicated through Prof. G. F. FitzGerald, F.R.S.—Prof. J. Joly, F.R.S., read a paper on a fractionating rain-gauge. The apparatus was exhibited and described.

PARIS.

Academy of Sciences, February 19.—M. Maurice Lévy in the chair.—Researches on the isomerism of the sulphocyanide derivatives, by M. Berthelot. Determinations of the heats of combustion and formation of the sulphocyanides and isosulphocyanides of methyl, ethyl and phenyl.—On the determination of the integrals of certain partial differential equations by their values on a closed contour, by M. Émile Picard.—The tetrahedric deformation of the earth and the displacement of the pole, by M. Marcel Bertrand. A discussion of Lowthian Green's theory, in which it is shown that no results inconsistent with facts are obtained by the logical development of this view. Six diagrams are given showing the tetrahedron of volcanic fractures and various sections of the earth on the assumption of the existence of the tetrahedron.—On the culture of blue lupins (*Lupinus angustifolius*), by MM. P. P. Dehérain and E. Demoussy. The experiments described show that the blue lupin is incapable of utilising by itself atmospheric nitrogen, although it may attain full development in the absence of nodules upon the roots. In the latter case the plant appears to profit by work carried out by bacteria living upon certain algæ. It was found that the roots of the blue lupin may bear nodules containing bacteria that are of no use to the plant.—On the new Giacobini comet, by M. Perrotin.—M. Stokes was elected a Foreign Associate in the place of the late M. Weierstrass, M. Zittel a Correspondant for the Section of Mineralogy, and M. Pfeffer a Correspondant for the Section of Botany.—On calculating machines, by M. L. Torres.—Remarks on a meteor which fell at Bjurböle (Finland) on March 12, 1899, by the French Consul in Finland.—Determination of surfaces having a system of lines of equal curvature, by M. R. Bricard.—On a transformation of isothermal surfaces, by M. C. Guichard.—On the problems of Neumann and Gauss, by M. W. Stekloff.—On functions with four pairs of periods, by M. G. Humbert.—Theory of helices of propulsion, by M. Rateau.—On the determination of standard lines in the spectrum, by M. Maurice Hamy. Four rays from a cadmium tube are selected, having approximate wave-lengths 644, 515, 508 and 466, and the exact ratios of the first to each of the last three determined with a high degree of precision.—Determination of new points of reference in the spectrum, by MM. A. Perot and Ch. Fabry. An application of the interference method previously described by the authors to the measurements of eighteen wave-lengths between $\lambda = 435{\cdot}8\ \mu\mu$ and $\lambda = 670{\cdot}8\ \mu\mu$, the error of the determination being less than one-millionth.—On a method of focussing a photographic telescope, by M. Georges Meslin.—A new interpretation of the results of M. Michelson for the analysis of homogeneous light by Newton's rings, by M. E. Carvallo.—The instantaneous disappearance of magnetic rotatory polarisation, by MM. H. Abraham and J. Lemoine. The authors apply the method previously used by them in the measurement of the duration of the Kerr phenomenon to the study of the extinction of magnetic rotation, and find that the polarisation is less than a hundred-millionth of a second ('000,000,01 sec.) behind the current producing it. Hence the magnetic rotation follows without any lag the variations in the fields which produce it.—On a method of preparation of alkaline arsenides, antimonides, and some alloys of the alkali metals, by M. P. Lebeau. The ordinary method of preparing arsenides by heating together the elements composing it, never gives a pure product, but if the crude arsenide thus obtained is extracted with liquid ammonia at - 80°, the excess of sodium is removed, and the Na_3As is left in a pure state. Na_3Sb, Na_3Bi, and Na_4Sn can be prepared in a similar manner.—On iodide of nitrogen, by M. C. Hugot. A study of the action of liquid ammonia upon iodine. The results obtained are expressed by the author in the equation

$$16NH_3 + 3I_2 = 3(NH_4I.3NH_3) + NI_3.3NH_3.$$

—Meconine, opianic acid, and hemipinic acid, by M. Emile Leroy. A thermochemical paper containing determinations of the heats of combustion and formation of meconine, opianic acid, its potassium salt, and methyl ether.—Resolution of racemic benzylidene-camphor. Isomorphism of the two active components, by M. J. Minguin. The splitting up was effected by adding a dextrorotatory crystal to the toluene solution of the racemic compound.—Rapid method for determining the carbonic acid in various gaseous mixtures, by MM. Léo Vignon and Louis Meunier. The method is only applicable to gases such as air or coal gas, which can be obtained in unlimited quantities, and consists of a titration with lime-water tinted with phenolphthalein.—On the volumetric estimation of boric acid, by M. Alfred Stock. The solution containing the boric acid is treated with a mixture of potassium iodide and iodate to remove free mineral acids, and the boric acid, which is without action upon this mixture, then titrated with soda in presence of mannite. It is absolutely essential that all the solutions should be boiled till free from carbon dioxide, quite erroneous results being obtained in presence of dissolved carbonic acid.—Researches on the genesis of compounds of the menthol series in plants, by M. Eugène Charabot.—On a new Epicarid, *Crinoniscus equitans*, by M. Ch. Pérez.—Development of the azygospores in *Entomophthora*, by M. Paul Vuillemin.—Relation between the variation of excitement of nerves and the variation of the

exciting currents of different potentials, by M. Stéphane Leduc.—The quotient of fatigue, $\frac{H}{N}$, by Mdlle. J. Joteyko.—New method for measuring the acuteness of hearing for the intensity of sound, by MM. Ed. Toulouse and N. Vaschide. The sounds are produced by drops of water falling upon a metallic plate, the variations in intensity being obtained by varying the height through which the drops fall.—On the normal asymmetry of the binary organs in man, by M. P. Godin.—On the composition and feeding value of the mammalia, birds and reptiles, by M. Balland.—The barometric oscillations of February 13–19, 1900, by M. Joseph Jaubert. The oscillations were remarkable on account of their amplitude and short period, four maxima and minima being noted in six days, with an average amplitude of over 10 mm.

CAPE TOWN.

South African Philosophical Society, January 31.—Mr. L. Péringuey, President, in the Chair.—Mr. Chas. F. Juritz read a paper, entitled "The Soils of the South-Western Districts of the Cape Colony." The low percentage of phosphates in some samples of oat-hay analysed by the author ten years ago, led him to urge the Government to allow investigations into the chemical nature of the colonial soils to be carried out. The work has progressed to a very considerable extent, but the area from St. Helena Bay to Mossel Bay having been also geologically surveyed, Mr. Juritz confined his present paper to it. Most of the soils analysed were from the Malmesbury and Bokkeveld Beds. In portions of the Malmesbury district the underlying limestone greatly aids the fertility of the soil and renders its wheat "rust-resistent." The lime dimishes in amount from D'Urbanville to Hopefield. The Caledon soils are poor, but those of Bredasdorp are much better. The soils on the Enon Beds of Swellendam and Mossel Bay are good all-round soils. Of the two hundred and twelve soils examined, only fifteen contain a satisfactory amount of phosphates, forty-five a normal amount of lime, and fifty-seven of potash.

DIARY OF SOCIETIES.

THURSDAY, MARCH 1.

ROYAL SOCIETY, at 4.30.—An Experimental Inquiry into Scurvy: F. G. Jackson and Prof. Vaughan Harley.—The Velocity of the Ions produced in Gases by Röntgen Rays: Prof. J. Zeleny.—Mathematical Contributions to the Theory of Evolution. VIII. On the Correlation of Characters not Quantitatively Measurable: Prof. K. Pearson, F.R.S.

LINNEAN SOCIETY, at 8.—On Botanic Nomenclature: C. B. Clarke, F.R.S.—On some Foraminifera of Tithonian Age from the Limestone of Nesseldorf: F. Chapman.

CHEMICAL SOCIETY, at 8.—Pilocarpine and the Alkaloids of Jaborandi Leaves: Dr. H. A. D. Jowett.—Isomeric Partially Racemic Salts containing Pentavalent Nitrogen, Parts I.–VII.: Prof. F. S. Kipping, F.R.S.—New Synthesis of Indene: Prof. F. S. Kipping, F.R.S., and Harold Hall.—(1) Potassium Nitrito-hydroximidosulphates and the Non-existence of Dihydroxylamine Derivatives: (2) Identification and Constitution of Fremy's "Sulphazotised Salts of Potassium": Dr. E. Divers, F.R.S., and Dr. T. Haga.—Some Acids obtained from α-Dibromocamphor: A. Lapworth and E. M. Chapman.

RÖNTGEN SOCIETY, at 8.—Measurements of the Absorbability of Röntgen Rays: J. H. Gardiner.—Skiagrams of Two Cases of Renal Calculus before and after Removal: Dr. Hugh Walsham.

FRIDAY, MARCH 2.

ROYAL INSTITUTION, at 9.—Malaria and Mosquitoes: Major Ronald Ross.

PHYSICAL SOCIETY (University College), at 4.30.—The Relative Rates of Effusion of Argon, Helium, and some other Gases: Dr. F. G. Donnan.—On the Distillation of Liquid Air and the Composition of the Gaseous and Liquid Phases: E. C. C. Baly.—The Reversibility of Galvanic Cells: T. S. Moore.—On the Damping of Galvanometer Needles: M. Solomon.

GEOLOGISTS' ASSOCIATION, at 8.—Wind-worn Pebbles in the British Isles: F. A. Bather.

SATURDAY, MARCH 3.

ROYAL INSTITUTION, at 3.—Polarised Light: Lord Rayleigh.

MONDAY, MARCH 5.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—In the Heart of Borneo: Charles Hose.

SOCIETY OF ARTS, at 8.—The Photography of Colour: E. Sanger Shepherd.

SOCIETY OF CHEMICAL INDUSTRY, at 8.—The Presence of Naphthalene in Coal Gas: R. W. Allen.—Notes on the Determination of the Iodine Value of Oils: Arthur Marshall.

VICTORIA INSTITUTE, at 4.30.—Coins of the Ancients: Dr. Zimmerman.

TUESDAY, MARCH 6.

ROYAL INSTITUTION, at 3.—Structure and Classification of Fishes: Prof. E. Ray Lankester, F.R.S.

ZOOLOGICAL SOCIETY, at 8.30.—Descriptions of New Reptiles and Batrachians from Borneo: G. A. Boulenger, F.R.S.—On the Brain of the Siamang (*Hylobates syndactylus*): F. E. Beddard, F.R.S.—On a Collection of Mammals from Siam: J. Lewis Bonhote.

INSTITUTION OF CIVIL ENGINEERS, at 8.—*Paper to be further discussed*: Corrosion of Marine Boilers: John Dewrance.—*And, time permitting, Papers to be read with a view to discussion*: A Short History of the Engineering Works of the Suez Canal: Sir Charles Hartley, K.C.M.G.

ROYAL PHOTOGRAPHIC SOCIETY, at 8.—Some Beauty Spots of English Scenery: John A. Hodges.

WEDNESDAY, MARCH 7.

SOCIETY OF ARTS, at 8.—Macombe's Country (South of the Zambesi): its Ancient Gold Fields and Industrial Resources: Dr. Carl Peters.

GEOLOGICAL SOCIETY, at 8.—Notes on the Geology of Gilgit: Lieut.-Gen. [C. A. McMahon, F.R.S.—(1) The Rocks of La Saline (Northern Jersey): (2) The Rocks of the South-eastern Coast of Jersey: John Parkinson.

ENTOMOLOGICAL SOCIETY, at 8.

SOCIETY OF PUBLIC ANALYSTS, at 8.—The Determination of Carbon and Sulphur in Steel: Bertram Blount.—Maize Oil: Rowland Williams.—Note on the Assay of Creosote: A. D. Hall.—Note on the Influence of Temperature and Concentration on the Saline Constituents of Boiler Waters: Cecil H. Cribb.

THURSDAY, MARCH 8.

ROYAL SOCIETY, at 4.30.—Bakerian Lecture: The Specific Heat of Metals and the Relation of Specific Heat to Atomic Weight: Prof. Tilden, F.R.S.

ROYAL INSTITUTION, at 3.

MATHEMATICAL SOCIETY, at 8.—On the Use of the Curve of Error as an Auxiliary Curve in Statistics with Tables: W. F. Sheppard.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—On the Applications of Electricity in Medical and Surgical Practice: Dr. H. Lewis Jones.

CAMERA CLUB, at 8.—Steam Turbines, Land and Marine: A. A. Campbell Swinton.

FRIDAY, MARCH 9.

ROYAL INSTITUTION, at 9.—Bacteria and Sewage: Prof. Frank Clowes.

ROYAL ASTRONOMICAL SOCIETY, at 8.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Distribution of Stress in the Walls of a Thick Cylinder: John Duncan, W. A. Wales, and G. J. Day.

SATURDAY, MARCH 10.

ROYAL INSTITUTION, at 3.—Polarised Light: Lord Rayleigh.

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